The Emigration of Caribbean Labourers' Effect on Economic Growth

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[1] The views, opinions, findings, and conclusions or recommendations expressed in this paper are strictly those of the author. They do not necessarily reflect the views of the Central Bank of The Bahamas. The Central Bank of The Bahamas takes no responsibility for any errors or omissions in, or the correctness of, the information contained in this paper.

Abstract

The Caribbean region has historically experienced some of the highest rates of emigration, as workers have left their country of origin to capitalize on the opportunities present in more economically developed countries.[2] This paper aims to analyse the impact of the departure of labour on the economic growth of Caribbean countries. A panel regression, using data from Barbados, Dominica, Guyana, Haiti, Jamaica, Trinidad & Tobago, and St. Vincent & Grenadines finds that there is a positive relationship between the net migration of Caribbean workers and economic growth. When mitigating the negative impacts of labour loss, policies that focus on moving towards becoming a more attractive economy for their citizens are recommended.

Keywords: GDP, Labour Markets, Economic Growth, The Caribbean

JEL Codes: O11, J60, I20

[2] Docquier, F., & Marfouk, A. (2004). Measuring the international mobility of skilled workers (1990-2000): release 1.0. *World Bank Policy Research Working Paper*, (3381).

Introduction

Migration has been described as “embedded in the Caribbean psyche” and is viewed as a fact of life for Caribbean nationals (Reyes and Stubbs, 2004). As labourers from the region immigrate to other countries for education, work, etc., a diaspora is then created as they become transnational citizens with close ties to their home country (Reyes and Stubbs, 2004). This region-wide mindset can be attributed to Caribbean countries’ role as a source, transit, and final destination of migrants in the global economy (Thomas-Hope, 2005). At present, migration from the Caribbean is predominantly extra-regional; 90.5% of Caribbean emigrants resided outside of the region, whereas only 9.5% lived in another country or territory within the region in 2020 (Migration Data Portal, 2023). This culture of migration has been sustained in the region over centuries due to various push and pull factors. Push factors influencing migration are circumstances or factors in the country of origin that drive individuals to leave their home country, whilst pull factors encompass the attractive traits of a country or region that appeal to migrants (Urbański, 2022). Crime and violence, a lack of economic and social opportunities, as well as difficulty in occupation-skill matching have been cited as major push factors for Jamaican citizens, and these issues can be encountered across the region (Parkins, 2010). Pull factors for migrants include access to employment opportunities, higher standards of living, better healthcare facilities, religious tolerance, and freedom from persecution (Urbański, 2022). Due to the prevalence of migration in Caribbean society, the economic implications for the region may already be visible in lagged growth.

Economic growth in the region and the emigration of labourers appear to interact through numerous facets. As the former slows and/or deteriorates, the pull to emigrate strengthens to pursue the higher wages and quality of life present in developed countries. This steady outflow of labour to developed countries from the Caribbean depletes the stock of human capital in the sending countries, and may negatively impact economic development (Docquier

et al., 2007). A decline in the size of the labour force applies upward pressure on wages and decreases competitiveness in the local economy, ultimately negatively impacting an economy's potential for growth and development. Stagnation in growth then urges some labourers to pursue job opportunities and mobility in more economically developed nations. This pattern of migration tends to be viewed as a major issue for Caribbean economies, but quantitative research on its effect has suffered due to the lack of consistent and reliable migration data (Juapart, 2023).

This paper attempts to quantify the effect of emigration on economic growth for The Caribbean region through a panel OLS regression modelling the effect net migration has on real gross domestic product (RGDP) in Barbados, Dominica, Guyana, Haiti, Jamaica, Trinidad & Tobago, and St. Vincent & Grenadines. The model includes a human capital development proxy, mean years of schooling, and remittances as these variables are intertwined with labour migration. The paper then explores two scenarios involving a push and pull factor, the local unemployment rate and the number of work and education permits issued by the Canadian government respectively, to analyse their role in influencing RGDP and net migration. The findings of the paper will supplement the limited quantitative research on migration in the region, due to what appears to be a lack of consistent and high-quality data on the movement of Caribbean labourers. Finally, the paper explores the relationship between the departure of workers and the economic growth of Caribbean countries, as well as policy responses to mitigate the continuous loss of labour. With this exploration, Caribbean economies can begin to influence migration patterns through the introduction of new policies that will accelerate the slow growth observed in the region.

Literature Review

As previously stated, economic growth and emigration interact through numerous factors in an economy. Previous literature explores the facets in which migration impacts sending countries' development, typically either through remittances, human capital stock, or labour productivity.[3] Emigration can supplement a country's GDP through the transmission of remittances from migrants working abroad, sent to their families still residing in their country of origin to aid in their ability to consume and invest. Mundaca (2009) developed a theoretical model for analysing the relationship between remittances, financial market development, and economic growth and found that remittances have positive effects on the equilibrium growth rates of the Latin American and Caribbean countries studied. The author asserted that remittances only have a sizable and sustained effect on the economy if they are devoted to long-run technology or capital investment. Meyer and Shera (2017) utilized multiple regression analysis to explore remittances' link to economic growth in Albania, Bulgaria, Macedonia, Moldova, Romania and Bosnia Herzegovina. The authors affirmed that workers' remittances had a significantly positive effect on GDP per capita growth and are most productive when the funds are allocated to consumption and investment. Nsiah and Fayissa's (2013) study estimated the macroeconomic weight of remittances in African, Asian, Latin American, and Caribbean regions' growth, in conjunction with the control variables the openness of the economy, the capital-to-labour ratio, and economic freedom. The results indicated that a 10.0% increase in remittances led to a 0.3% in long-run economic growth in the Caribbean region. The authors further explained that remittances were increasingly prone to have a significantly positive long-run impact on economic growth in regions where they were chiefly used for investments. As remittances to sending countries are expected to grow

[3] A sending country refers to a migrant's country of origin, i.e. the country they are emigrating from.

by 1.4% in 2023, the study of this facet of migration will continue to be relevant for developing countries (The World Bank, 2023).

Whilst remittances are typically associated with positive growth, emigration can have negative repercussions for the local labour force and its productivity. Atoyan et al. (2016) discussed how large-scale emigration from Central, Eastern, and South-eastern Europe (CESEE) may deplete the pool of labour and its productivity, harming economic growth in sending countries and slowing per capita income convergence. The authors conducted simulations utilising a semi-structural general equilibrium model where migration impacted the real economy through labour outflows, remittance inflows, external competitiveness, and public sector balance sheets to measure the potential impact of continued emigration from the region. Atoyan et al. (2016) projected that emigration will reduce real GDP and GDP per capita concurrently for all sending countries, with the cumulative output loss expected to be near 9.0%. Ultimately, the authors noted that the significant labour outflows have lowered potential growth in CESEE. Lanati and Thiele (2021) examined numerous panel data models to explore the effect GDP per capita has on emigration rates to OECD countries, and found that rising per-capita GDP lessened emigration from developing countries. The authors attributed this result to the closing of the wage gaps between the countries of origin and destination, irrespective of skill or income level. Mishra (2006) discerned that the total losses due to skilled migration, including emigration loss predicted by the labour-demand supply framework and the government expenditure on educating migrants, outweigh the positive effect of remittances for most countries in the Caribbean. The author calculated emigration loss as a percent of GDP by utilizing estimates of -0.3[4] and -0.4 for the elasticity of factor price for labour, 70.0% for the labour's share in national income, and the emigration rate.

[4] An elasticity of factor price for labour of -0.3 indicates that a 10.0% reduction in the size of the labour force increases wages by 3.0%.

Mishra (2006) found that the emigration loss predicted by the labour demand-supply model was small for all workers, but observed that the losses due to emigration of skilled labour, *ceteris paribus,* were significant.

Chamon et al. (2017) named the emigration of skilled labourers, referred to as the 'brain drain', as a key determinant of the Caribbean region's stifled growth. In a review of country characteristics needed for medium-term growth, the authors noted that Caribbean economies' struggled with brain drain relative to other country groups and explained that skilled emigration lowers growth by waning an economy's stock of human capital. Brain drain can be a double-edged sword for sending countries, making it a topic of interest in wider research on emigration and its macroeconomic effects. When countries experience brain drain, migration opportunities encourage households to invest in education due to the higher expected returns on educational investment when individuals emigrate, the 'brain effect', whilst the 'drain effect' kicks in when a significant number of these educated individuals emigrate. Beine et al. (2001) proposed that beneficial brain drain (BBD) occurs when the brain effect dominates and used empirical evidence from developing countries to determine whether the concept was purely theoretical. The authors determined that BBD is feasible when an economy is not operating in an underdevelopment trap, when the probability of migration is sizeable enough to induce a significant brain effect but not so much so that the drain effect arises, and when an economy demonstrates relatively strong growth. Adeyemi et al. (2018) linked brain drain to the low growth rates in Nigeria, Ethiopia, and Kenya, and utilized the dynamic Ordinary Least Squares method to investigate the link between the emigration of skilled labour and economic development. The authors observed that a unit increase in brain drain negatively impacted economic growth by 1.16E+11. Moreover, the authors discerned that school enrolment, a proxy for human capital development, and remittances also played a substantial role in how brain drain impacted economic growth in

the three African countries. Wong and Yip (1999) developed a two-sector, endogenous growth model to study the relationship between economic growth and brain drain, and learned that a decrease in the growth rate of human capital caused by skilled emigration harms future generations and damages the growth of the sending country. As can be seen, previous economic literature handling economic growth and emigration indicates that they are interlinked, as movements in one, directly and indirectly, influence movements in the other and vice versa. The relationship between the two variables is further explored in this paper, to expand the seemingly limited quantitative research on emigration's effect on economic growth in the Caribbean region.

Data and Methodology

The model developed in the paper follows the lead of Adeyemi et al. (2018), in using the Ordinary Least Square method for panel regression analysis. Time series data from 1990 to 2020 on Barbados, Dominica, Guyana, Haiti, Jamaica, Trinidad & Tobago, and St. Vincent & Grenadines was used to create a model that demonstrates the relationship between economic growth and the emigration of Caribbean labourers. The countries were chosen based on data availability.[5] To determine the responsiveness of economic growth to net migration and related variables, the equation for the baseline model is as follows:

$$(1)\quad Ln|RGDP_{it}| = \beta_0 + \beta_1|LnREM_{it}| + \beta_2 Ln|MYS_{it}| + \beta_3 Ln|NEM_{it}| + \varepsilon_{it}$$

The natural log of real gross domestic product (RGDP) was used as a proxy for economic growth and acted as the dependent variable in the model, whilst net migration (NEM) was utilized as a proxy for emigration. Personal remittances received (REM) and mean years of schooling (MYS), a proxy for human capital development, were incorporated into the model as additional independent variables due to their relevance to migration. Net migration, RGDP, remittances, and unemployment rate data were retrieved from the World Bank Open Data source. The number of study and education permits issued to Caribbean immigrants was collected from the Government of Canada's website, which publishes datasets tabulated by local institutions. Data on mean years of schooling was retrieved from the United Nations Human Development composite indices tables. A push and pull factor were then added in two separate scenarios, to investigate their function in net migration's effect on economic growth over the given period. The unemployment rate in the respective Caribbean countries was applied as a push factor, as the lack of jobs and job mobility is an instigator for citizens to

[5] The seven countries selected had the necessary data available for analysis, those excluded had too limited of data available.

immigrate to more economically developed countries. The equation for the push factor scenario is given below:

(2) $Ln|RGDP_{it}| = \beta_0 + \beta_1|LnREM_{it}| + \beta_2 Ln|MYS_{it}| + \beta_3 Ln|NEM_{it}| + \beta_4 Ln|UEM_{it}| + \varepsilon_{it}$

For the pull factor, the number of work and education permits issued by the Canadian government was chosen, as it is one of the primary destinations for Caribbean migrants[6]. The variable was integrated to represent the change in the immigration policies of countries in the global north to increasingly open channels to foreign nationals, specifically to those who are highly skilled (Skeldon, 2009). The pull factor scenario is seen here:

(3) $Ln|RGDP_{it}| = \beta_0 + \beta_1|LnREM_{it}| + \beta_2 Ln|MYS_{it}| + \beta_3 Ln|NEM_{it}| + \beta_4 Ln|EWO_{it}| + \varepsilon_{it}$

The expected signs can be seen in Table 1, based on the literature reviewed and the authors' intuition. The dataset was tested for its time series properties of the variables with the Augmented Dickey-Fuller (ADF) unit root test, along with the heteroscedasticity.

[6] Data from Canada was used over U.S. or U.K. data, the other primary receiving countries, because the U.S. data is recorded in fiscal years, whereas all variables in the model are recorded in calendar years, and U.K. data on work and education permits issued to Caribbean immigrants were unavailable.

Results

All variables were found to be statistically significant at the 10.0% level in the baseline model, as seen in Table 1. For every 1.0% increase in net migration, economic growth increased by 0.3%. A percent-increase in mean years of schooling grew RGDP by 1.2%. Finally, RGDP strengthened by 0.1% with every 1.0% rise in remittances received. The complete results of the model, including scenarios, are provided in Appendices A to C. The baseline model explained 26.0% of the variations in RGDP over the 21 years observed. In the first scenario, for every 1.0% increase in the unemployment rate for Caribbean countries decreased RGDP by 2.0% (Table 2). The model including unemployment explained 74.2% of the variations in the proxy for economic growth. It is important to note that net migration was not statistically significant in the unemployment scenario, whilst all other variables were found to be significant. Table 3 presents the results for the second scenario; a 1.0% increase in the number of work and education permits issued by the Canadian government positively impacted RGDP by 0.3%. All variables were statistically significant in this scenario and 29.6% of movements in RGDP were explained by this model. Descriptive statistics for the time series data used in the model can be found in Appendix D. For ordinary least squares (OLS) regression results to be reliable, the macroeconomic time series data used must be stationary (Adeyemi et al., 2018). The ADF unit root test, seen in Appendix E, indicated the time series data was found to be stationary at the 10.0% confidence level. The variables in the model were found to be heteroscedastic, contrary to the assumptions made for linear regression models (Appendix F).

Table 1: BASELINE				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNNEM	0.26019	0.05667	4.59117	0.0000
LNMYS	1.19225	0.45328	2.63025	0.0095
LNREM	0.09208	0.03720	2.47530	0.0145
C	6.94794	0.56084	12.38839	0.0000
R-squared	0.258613			
Adjusted R-squared	0.24306			

Table 2: SCENARIO 1 - UNEMPLOYMENT RATE[7]				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNNEM	0.032168	0.032675	0.984495	0.3268
LNMYS	-1.5994	0.263538	-6.068954	0.0000
LNREM	0.044774	0.018777	2.384571	0.0187
LNUEM	-1.991537	0.118075	-16.86668	0.0000
C	12.75718	0.399032	31.97035	0.0000
R-squared	0.742248			
Adjusted R-squared	0.733727			

Table 3: SCENARIO 2 - CANADIAN WORK AND EDUCATION PERMITS				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNNEM	0.228324	0.056645	4.030777	0.0001
LNMYS	1.14083	0.443767	2.570788	0.0112
LNREM	0.080277	0.036639	2.191005	0.0301
LNEWO	0.25082	0.091784	2.73271	0.0071
C	6.564352	0.566249	11.59269	0.0000
R-squared	0.295654			
Adjusted R-squared	0.275813			

[7] Dominica was excluded from this scenario due to insufficient unemployment rate data.

Discussion

The key finding of the model is that emigration does have a statistically significant impact on economic growth. The proxy variable, net migration, exhibited a positive relationship with RGDP in the Caribbean, illustrating that the two move in tandem. As net migration decreases, more persons are leaving the country than entering, potentially depleting a country's labour force. Declines in the size of the labour force or its productivity will ultimately lower potential growth in sending countries, as demonstrated by the baseline. In the opposite direction, an increase in net migration indicates a greater amount of migrants are entering than departing, and this supplements RGDP as the human capital stock increases. The influence of net migration on economic growth can still be ambiguous despite these results, depending on the ratio and demographic[8] of those entering, to those leaving the country. The relatively small coefficient of net migration is indicative of this ambiguity, as each country in the dataset experiences varying migration flows and thus, varying degrees of net migration's impact on RGDP. If emigration rates are high, especially for highly educated workers, the effect on economic growth becomes unambiguously negative; the continued deterioration of the labour force in both size and productivity will ultimately overshadow the positive growth stimulated by remittances (Adeyemi et al., 2018). Given that net migration was negative for most of the countries in the sample, indicating greater outflows of labour, it can inferred that Caribbean economies have been suffering due to the considerable emigration from the region.

It can be seen that whilst elevated rates of emigration can handicap the Caribbean's capacity to grow, it does not have nearly the same tangible impact as human capital development. With the largest coefficient of all the predictor variables in the baseline model,

[8] Age and educational attainment are two key characteristics of migrants that determine the amplitude of net migration's effect on an economy.

mean years of schooling is a crucial determinant of economic development for Caribbean economies. Adeyemi et al. (2018) and Adelakun (2011) both garnered similar results when exploring the emigration of highly educated workers and human capital development's relationship with economic growth, respectively. Human capital formation affects economic growth when the educated population enters the labour force and utilizes their skills to contribute to the production of goods and services (Son, 2010). Higher quality education and training strengthens per capita income growth in developing countries because the educated workforce earns more and tends to have a financial cushion and life skills that mitigate the risk of re-entering poverty (Jimenez et al., 2012). Human capital development has increased the utilization of resources, in conjunction with a multiplier effect that has led to economic growth in Nigeria, and the model conveys that the Caribbean region is likely no different (Adelakun, 2011). The results are in line with the theoretical predictions and illustrate that a higher average years of schooling for Caribbean countries will result in accelerated economic growth, and is a crucial element in the region's development.

For the final variable in the baseline, remittances' significance in the model is indicative of its noteworthy impact on economic growth, as the funds remitted by emigrants working abroad increase consumption and investment in sending countries. The positive relationship between remittances and economic growth stems from the fact that remittances supplement households' income, allowing them to afford essential items, i.e. food, housing, and utilities, as well as savings or investments for the future, effectively raising income per capita. The overall direction of emigration's impact on a country's economic growth is determined by the magnitude of the losses due to migration net the gains from remittances. In the baseline model, the effect of net migration is stronger than that of remittances' and thus, the overall impact of emigration can be interpreted as negative for the Caribbean region. This result is consistent with the analysis done by the International Monetary Fund (IMF), which

expounded that although remittances are beneficial for the sending country, the negative impact on labour resources and productivity outweighs the growth gains from remittances (Alleyne et al., 2017).

Higher unemployment rates were seen to have negative consequences for economic growth in the Caribbean. This outcome is in line with Okun's Law (1962), an economic model that asserted that the unemployment rate is inversely related to potential output, dependent upon participation in the workforce, duration of work and changes in productivity (Soylu et al., 2018). The first scenario illustrated a similar sentiment for the region. Both real and potential output suffer when unemployment heightens due to a shrinkage in the size of the employed labour force, resulting in stifled production and growth for an economy. Moreover, the lack of ideal job opportunities due to factors such as failure to match one's skills to a job, the absence of professional development, and the significant wage differentials between developing and developed countries, perpetuate unemployment and urge labourers to relocate (Parkins, 2010). Unemployment inhibits growth in the Caribbean by reducing the size of the labour force and its productivity and by forcing workers to emigrate for better opportunities. The baseline variables behaved similarly in this particular scenario, with slight deviations in magnitude, excluding mean years of schooling, which took on a negative coefficient. This result is contradictory to the economic literature regarding the positive impact of human capital development on economic growth. This model also possessed a significantly higher R^2 than the other models, so multi-collinearity was investigated and found to be present among the independent variables.[9] The high correlation observed between mean years of schooling and the unemployment rate likely resulted in an interaction that gave the latter a negative coefficient. The pair are connected, as a higher level of educational attainment results in increased labour productivity and can ensure greater labour market

[9] Results for the VIF tests for multi-collinearity are available upon request.

success for workers, decreasing unemployment (ILO, 2015). Further, the insignificance of net migration in the scenario can be explained by the presence of multi-collinearity. The time-series data used in the model struggles with multi-collinearity because the regressors in the model are all closely associated and have increased over time (Alin, 2010).

In the second scenario explored, an increase in the education and work permits issued by a developed country had a positive effect on economic growth for the Caribbean countries observed. This outcome can be attributed to the impact that the culture of migration has had on the decision-making process for households in the region. Emigration of labourers, especially highly skilled labourers, produces stronger incentives to acquire skills, even for immobile workers (Eggert et al., 2010). To expand, the possibility of migration likely has encouraged individuals in the region to pursue higher education, therefore increasing the population's demand for education. As the general population achieves higher levels of educational attainment, those who were not able to migrate or return are able to contribute to the origin country's output, that is, RGDP. The local labour force becomes more productive as a result, due to an increase in the educated workforce, and bolsters output and economic growth. The independent variables RGDP, net migration, and mean years of schooling also behaved as they had in the baseline, again with slight differences in magnitude, in the latter scenario.

Docquier and Rapoport (2012) iterated that many macroeconomic studies have been unable to identify the causal effects of high-skill emigration on development in a fully convincing way, partially due to data constraints. This study faced similar difficulties, as the proxies used in the model can be imperfect when representing emigration, human capital development, economic growth, and push and pull factors for migration due to data limitations. Further, the dataset suffered from multi-collinearity among the independent variables and heteroscedasticity due to the nature of the time-series data utilized. Despite

long-transforming the variables in an attempt to mitigate these issues with the data, they remained. The variables chosen for the model: educational attainment, remittances and net migration, are too closely related for the times-series data to meet the requirements of a classic OLS linear regression model. Due to the limitations of the data, the model is still in the process of development. In the event that the quality and quantity of data available on Caribbean emigration improves, the model can utilise independent variables that are not as closely related to reduce the influence of multi-collinearity on the results. Additionally, a greater wealth of data could allow for the estimation of the effect of additional variables such as return migration, crime and violence, and wage differentials, on economic growth. Future iterations of the paper should explore alternative, possibly non-linear models, to better capture the relationship between economic growth and emigration for the region. Finally, future studies are encouraged to further explore the complexity of the relationship between emigration and development in the region by looking at how economic growth impacts migration decisions, as only one direction of the relationship was evaluated in this paper.

Policy Implications

The concern regarding excessive rates of emigration, especially for highly skilled labourers, in the Caribbean can be seen from two differing perspectives. This paper explored one point of view that hypothesizes that high levels of emigration have slowed the development and growth of the region. Whilst emigration can have a negative impact on RGDP in the long run, the relationship between growth and migration is far more multifaceted than the one analysed in this study. The alternative point of view argues that the stifled growth observed in the Caribbean in recent decades is what is propelling the movement of labour, rather than the reverse. This paper recommends government policymakers address the root of the issue of weak growth, particularly by developing the skills of labourers in relevant fields. With the focus now on development, policymakers should enact legislation that reinvigorates human capital formation in the region, and create job opportunities for all skill levels. The quality of primary and secondary education must be improved by enforcing requirements for school leadership, as effective leaders will guide, inspire, and motivate students (Vaillant, 2015). Investing in education infrastructure, such as spacious classrooms, well-equipped laboratories, and well-stocked libraries, for all levels of education, can aid in increasing and retaining the educated population (Mishra, 2006). By reorienting the higher education system to equip workers with the skills that are in demand, the labour force can then increase its productivity and competitiveness. Training programmes that are tailored to the local labour markets for roles akin to lower-level medical personnel, skilled tradesmen, and hospitality workers are likely to have a positive effect on development, provided that working conditions are improved (Skeldon, 2009). As education does not exist in a vacuum, governments should also enact policies that enhance workforce planning based on the needs present in the local economy to ensure that occupations will be available for the newly educated domestic population. An in-depth analysis of labour market

demand for each country would uncover the fields facing shortages, allowing for policies to target these areas with increased investments in domestic skill development to address skills gaps (Juapart, 2023). Policymakers can then attract workers to their country, including citizens living abroad and foreign individuals, by investing in grant schemes and offering employment opportunities, including positions at local universities and institutions for highly educated workers (Skeldon, 2009). A stronger labour force, in size and productivity, would supplement the lagged economic growth rates for the region.

Conclusion

To conclude, high rates of emigration likely act as an indicator of shortfalls in Caribbean countries' policies, rather than the source of slow growth. This paper explored its relationship with GDP in the past twenty-one years and found that while it can adversely affect economic development for the region in the long run, it does not entirely explain the slower trend due to the limitations of the dataset. It is recommended that Caribbean policymakers focus on improving the access and process of human capital formation in the region by investing in research and development for relevant industries in the region that would both educate and employ labourers.

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Appendix A

Baseline Model Results

BASELINE

Dependent Variable: LNRGDP
Method: Panel Least Squares
Sample: 2000 2020
Periods included: 21
Cross-sections included: 7
Total panel (balanced) observations: 147

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNNEM	0.26019	0.05667	4.59117	0.0000
LNMYS	1.19225	0.45328	2.63025	0.0095
LNREM	0.09208	0.03720	2.47530	0.0145
C	6.94794	0.56084	12.38839	0.0000

R-squared	0.258613	Mean dependent var	9.63073
Adjusted R-squared	0.24306	S.D. dependent var	0.596765
S.E. of regression	0.51920	Akaike info criterion	1.553777
Sum squared resid	38.54825	Schwarz criterion	1.635149
Log-likelihood	-110.20260	Hannan-Quinn criter.	1.586839
F-statistic	16.62722	Durbin-Watson stat	0.091633
Prob(F-statistic)	0.00000		

Appendix B

Push Factor Scenario Results

SCENARIO 2: UNEMPLOYMENT RATE*

Dependent Variable: LNRGDP
Method: Panel Least Squares
Sample: 2000 2020
Periods included: 21
Cross-sections included: 6
Total panel (balanced) observations:
126

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNNEM	0.032168	0.032675	0.984495	0.3268
LNMYS	-1.5994	0.263538	-6.068954	0.0000
LNREM	0.044774	0.018777	2.384571	0.0187
LNUEM	-1.991537	0.118075	-16.86668	0.0000
C	12.75718	0.399032	31.97035	0.0000

R-squared	0.742248	Mean dependent var	9.785713
Adjusted R-squared	0.733727	S.D. dependent var	0.496147
S.E. of regression	0.25602	Akaike info criterion	0.15175
Sum squared resid	7.931083	Schwarz criterion	0.264301
Log-likelihood	-4.560243	Hannan-Quinn criter.	0.197476
F-statistic	87.11086	Durbin-Watson stat	0.132802
Prob(F-statistic)	0		

*Dominica was excluded from this scenario due to insufficient unemployment rate data

Appendix C

Pull Factor Scenario Results

SCENARIO 3: CANADIAN WORK AND EDUCATION PERMITS

Dependent Variable: LNRGDP
Method: Panel Least Squares
Sample: 2000 2020
Periods included: 21
Cross-sections included: 7
Total panel (balanced) observations: 147

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNNEM	0.228324	0.056645	4.030777	0.0001
LNMYS	1.14083	0.443767	2.570788	0.0112
LNREM	0.080277	0.036639	2.191005	0.0301
LNEWO	0.25082	0.091784	2.73271	0.0071
C	6.564352	0.566249	11.59269	0.0000

R-squared	0.295654	Mean dependent var	9.63073
Adjusted R-squared	0.275813	S.D. dependent var	0.596765
S.E. of regression	0.507842	Akaike info criterion	1.516129
Sum squared resid	36.6223	Schwarz criterion	1.617845
Log-likelihood	-106.4355	Hannan-Quinn criter.	1.557457
F-statistic	14.90136	Durbin-Watson stat	0.076561
Prob(F-statistic)	0		

Appendix D

Descriptive Statistics

	RGDP	REM	NEM	MYS	EWO	UME (%)
Mean	8,440,000,000.00	684,000,000.00	(7,975.80)	8.21	604.4558	11.38
Median	4,810,000,000.00	155,000,000.00	(1,757.00)	8.20	385	11.01
Maximum	27,100,000,000.00	3,560,000,000.00	35,502.00	11.61	4315	21.10
Minimum	415,000,000.00	-	(35,007.00)	3.75	35	2.43
Std. Dev.	7,720,000,000.00	925,000,000.00	11,619.02	1.83	834.6907	4.90
Skewness	0.71	1.23	(0.33)	(0.59)	2.936279	0.24
Kurtosis	2.39	3.06	4.31	3.01	11.32944	2.27
Jarque-Bera	14.68	36.94	13.30	8.60	636.1823	4.06
Probability	0.00	-	0.00	0.01	0	0.13
Sum	1,240,000,000,000.00	101,000,000,000.00	(1,172,442.00)	1,206.98	88855	1,433.31
Sum Sq. Dev.	8,700,000,000,000,000,000,000.00	125,000,000,000,000,000,000.00	19,700,000,000.00	487.88	1.02E+08	3,000.09
Observations	147	147	147	147	147	126

Appendix E

Augmented Dickey-Fuller Test Results

Variables	**Level**	
	C	**C & T**
LNREM	0.0834	0.0865
LNNEM	0.0108	0.0028
LNMYS	0.0231	0.0138
LNEWO	0.1164	0.0988
LNUEM	0.0235	0.0267
C = Intercept		
T = Trend		

Appendix F

Panel Cross-section Heteroscedasticity LR Test

Panel Cross-section Heteroskedasticity LR Test
Equation: UNTITLED
Specification: LNRGDP LNNEM LNMYS LNREM C
Null hypothesis: Residuals are homoskedastic

	Value	df	Probability
Likelihood ratio	276.9279	7	0.0000

LR test summary:

	Value	df
Restricted LogL	-110.2026	143
Unrestricted LogL	28.26133	143

Unrestricted Test Equation:
Dependent Variable: LNRGDP
Method: Panel EGLS (Cross-section weights)
Sample: 2000 2020
Periods included: 21
Cross-sections included: 7
Total panel (balanced) observations: 147
Iterate weights to convergence
Convergence achieved after 38 weight iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNNEM	0.014316	0.002337	6.125254	0.0000
LNMYS	0.061109	0.019204	3.182061	0.0018
LNREM	0.151120	0.011405	13.24979	0.0000
C	8.630808	0.101308	85.19396	0.0000

Weighted Statistics

Root MSE	0.635535	R-squared	0.667262
Mean dependent var	163.9886	Adjusted R-squared	0.660281
S.D. dependent var	257.5857	S.E. of regression	0.644362
Akaike info criterion	-0.330086	Sum squared resid	59.37397
Schwarz criterion	-0.248714	Log likelihood	28.26133
Hannan-Quinn criter.	-0.297024	F-statistic	95.58918
Durbin-Watson stat	0.180239	Prob(F-statistic)	0.000000

Unweighted Statistics

R-squared	-0.141955	Mean dependent var	9.630730
Sum squared resid	59.37566	Durbin-Watson stat	0.026608